

SM/08/134
Correction 2

June 17, 2008

To: Members of the Executive Board
From: The Secretary
Subject: **Thailand—Selected Issues**

The attached corrections to SM/08/134 (5/5/08) have been provided by the staff.

Typographical Error

Page 7, line 1, formula: for “ $z_t^e = \delta_z z_{t+1} + (1 - \delta_z) z_{t-1}$ ” read “ $z_{t+1}^e = \delta_z z_{t+1} + (1 - \delta_z) z_{t-1}$ ”

Factual Errors Not Affecting the Presentation of Staff’s Analysis or Views

Page 21, para. 29, bullet 1, line 3: for “markets,” read “market structures,”
for “was higher” read “was on average higher”
line 4: for “Country-specific”
read “Global as well as country specific”
line 5: for “for volatility”
read “for explaining temporary movements in volatility”;
for “to domestic political developments, and subsided
thereafter.”
read “likely to the implementation of the URR, and
subsided thereafter.” and corrected for overflow of text.

Page 22, para. 31, line 2: for “has tripled” read “has doubled”
line 3: for “April 2007 (double the levels of 2004).” read “April 2007.”

- Page 24, para. 35, bullet 2, line 3:** for “Similar...elsewhere.”
read “Currently, the NOP limits are not binding and thus are not a hindrance to foreign exchange market development in Thailand. But similar initiatives have been undertaken elsewhere as a means to enhance the flexibility of liquidity management on the part of banks but also with an eye toward market development.”
- line 4:** for “Korea increased”
read “ Korea, for instance, increased”
- line 10:** for “options, futures, and forward contracts play”
read “options and futures play”
- line 12:** “As of now, most derivativs remain subject to case by case approval requirements by regulators.” removed and corrected for overflow of text.

Questions may be referred to Mr. Kalra, APD (ext. 36142).

This document will shortly be posted on the extranet, a secure website for Executive Directors and member country authorities.

Att: (4)

Other Distribution:
Department Heads

$$\underline{z_t^e = \delta_z z_{t+1} + (1 - \delta_z) z_{t-1}} \quad z_{t+1}^e = \delta_z z_{t+1} + (1 - \delta_z) z_{t-1}$$

Monetary policy rule

The monetary policy reaction function is a variant of the Taylor rule—a forward-looking rule because interest rates are set as a function of expected future inflation ($\pi_{t+4}^4 - \pi_{t+4}^*$) as well as the output gap $ygap$. When these variables are zero, interest rates are set to “normal” levels ($RR_t^* + \pi_t^4$). As is standard in reaction functions, we allow for “smoothing” in rate setting by introducing a lag term. The policy instrument is a short-term nominal interest rate and the central bank sets this instrument to anchor inflation to a target level, π^* , over time:

$$RS_t = \alpha_1 RS_{t-1} + (1 - \alpha_1)(RR_t^* + \pi_t^4 + \alpha_2(\pi_{t+4}^4 - \pi_{t+4}^*) + \alpha_3 ygap_t + \varepsilon_t^{RS}$$

The Rest of the world (US)

The rest of the world is represented by the U.S. economy. The behavioral equations are similar but without the world influences.

Output gap

$$yusgap_t = \beta_1^{us} yusgap_{t-1} + \beta_2^{us} yusgap_{t+1} - \beta_3^{us} (RRus_{t-1} - RRus_{t-1}^*) + \varepsilon_t^{yus}$$

Phillips curve

$$\pi us_t = \delta_1^{us} \pi us_{t+4}^4 + (1 - \delta_1^{us}) \pi us_{t-1}^4 + \delta_2^{us} yusgap_{t-1} + \varepsilon_t^{\pi us}$$

Policy reaction rule

$$RSus_t = \alpha_1^{us} RSus_{t-1} + (1 - \alpha_1^{us})(RRus_t^* + \pi us_t^4 + \alpha_2^{us}(\pi us_{t+4}^4 - \pi us_{t+4}^*) + \alpha_3^{us} yusgap_t + \varepsilon_t^{RSus}$$

9. **The model is estimated with Bayesian techniques.** These are based on the influential work of Schorfheide (2000). Papers using a Bayesian approach in the estimation of open economy DSGE models include Lubik and Schorfheide (2003) and Justiniano and Preston (2004). There are several advantages of using Bayesian methods for inference in estimating macroeconomic models. For our purposes, we highlight the fact that because Bayesian methods seek to characterize the posterior distribution of the parameters, they facilitate an accurate assessment of all of the uncertainty surrounding the model’s coefficients. Indeed, posterior inference provides us with posterior probability bands without

having to assume, for instance, symmetry in these distributions.⁴ We briefly sketch our approach to inference, and the reader is referred to the above references for further details. Defining Θ as the parameter space, we wish to estimate the model parameters denoted by $\theta \in \Theta$. Given a prior $p(\theta)$, the posterior density of the model parameters, θ , is given by:

$$p(\theta|Y^T) = \frac{L(Y^T|\theta)p(\theta)}{\int L(Y^T|\theta)p(\theta)d\theta}$$

where $L(Y^T|\theta)$ is the likelihood conditional on observed data, Y^T . The likelihood function is computed under the assumption of normally distributed disturbances by combining the state-space representation implied by the solution of the linear rational expectations model and the Kalman filter. Our goal is to therefore characterize the posterior density of the parameters. To do so, we follow a two-step approach. In the first step, a numerical algorithm is used to find an initial guess of the posterior mode by combining the likelihood $L(Y^T|\theta)$ with the prior. The posterior mode obtained from this first step is used as the starting value (θ^0) of a multiple chain Random Walk Metropolis algorithm. This Markov Chain Monte Carlo (MCMC) method allows us to generate draws from the posterior density $p(\theta|Y^T)$. At each step i of the Markov Chain, the proposal density is used to draw a new candidate parameter $\theta^* \propto N(\theta^i, c\Sigma)$. The new draw is then accepted with the following probability:

$$\omega = \min \left\{ 1, \frac{L(Y^T|\theta^*)p(\theta^*)}{\int L(Y^T|\theta^i)p(\theta^i)} \right\}.$$

If accepted, $\theta_k^{i+1} = \theta_k^*$, otherwise, $\theta_k^{i+1} = \theta_k^i$. The total number of iterations generated in this manner is 100,000 replications in this manner, and we discarded the first 50,000 iterations while monitoring the convergence of the generated draws using potential scale reduction factors and trace plots. The scaling constant for the variance covariance matrix, c , is chosen to attain a 30 percent acceptance rate. With the generated draws, point estimates of θ can be obtained from the simulated values by using various location measures, such as means or medians. Similarly, measures of uncertainty follow from computing the percentiles of the draws.

⁴ There are also clear advantages when it comes to model comparisons because the models are not required to be nested and numerical methods for the computation of the marginal likelihood permit constructing posterior model probabilities. These probabilities can in turn be used for model averaging, thereby producing parameter estimates that also explicitly incorporate model uncertainty. Furthermore, as emphasized by Smets and Wouters (2003), the use of Bayesian methods provides greater stability to optimization algorithms relative to maximum likelihood.

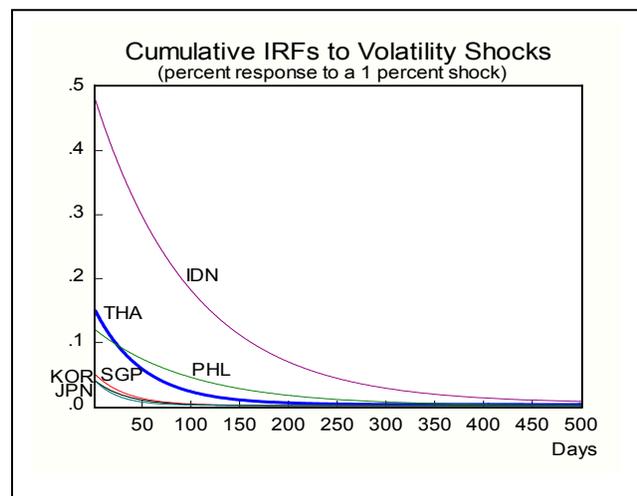
29. **Volatility patterns are more discernible at lower frequencies.** Figures 4 and 5 show foreign exchange return volatilities—for periods and on a rolling basis—at the monthly (23 trading days), quarterly (65 trading days), and annual (261 trading days) frequencies. The following stylized facts emerge:

- There was no uniform pattern of volatility across countries. Differences across countries reflect different degrees of exchange rate flexibility, institutional differences across market structures, and market depth for the currencies. Volatility in IDN, KOR, and JPN was on average higher relative to other countries. Global as well as cCountry-specific factors appear to have been important for explaining temporary movements in volatility. For THA, for example, volatility spiked at end-2006 related likely to the implementation of the URR to domestic political developments, and subsided thereafter.

- Volatility in CHN rose after the shift to some flexibility in exchange rate management in mid-2005. This happened in MYS as well, coinciding with the onset of movements in the renminbi. Other countries also witnessed temporary spikes in volatility around this time, suggesting that currencies in the region may have begun to move more closely with the renminbi than in the past. For IDN and KOR, volatility was on a declining trend. For PHL, volatility trended down until end-2004, and rose thereafter, especially in 2007. For IND, volatility was on a rising trend after 2003; it remained at a virtually unchanged level for SGP for the entire sample period. For a number of the countries, volatility levels spiked after mid-2007 reflecting global developments, but then stabilized or subsided.

- Pairwise correlations of volatility for individual countries with global volatility and among countries varied. Contemporaneous (positive) correlation in country volatility with global volatility was high (defined as correlation greater than 0.25) for IDN, KOR, SGP, and JPN (Table 3). Across countries, volatility in the Thai baht moved most closely with the Korean won and the Singapore dollar. For other countries in the sample, the high correlations are highlighted in Table 3.¹⁵

30. **Econometric models suggest that deeper and well-developed foreign exchange markets are conducive to lower persistence to volatility shocks.** Persistence to shocks is common in



¹⁵ Correlations for MYS and CHN can be ignored in this table as they include the fixed exchange rate period. For the same reason, MYS and CHN were also dropped from the model estimation.

financial time series. Impulse response functions—from the error-term representation of GARCH processes estimated by staff (Appendix)—show this persistence. Among six East Asian countries, three potential groups are: Korea, Singapore, and Japan which exhibit lower persistence; Thailand and Philippines; and finally Indonesia which exhibit higher persistence to volatility shocks. The differential persistence could be due to variety of factors, including the degree of exchange rate flexibility in monetary management, institutional differences across currency markets, and the depth of the market for the currency.

C. The Foreign Exchange Market in Thailand

31. **Thailand has made significant progress over the last decade in enhancing the depth and functioning of its foreign exchange market.** Market turnover has **doubled** ~~tripled~~ since 1998 with average daily turnover increasing to over US\$6 billion in April 2007 ~~(double the levels of 2004)~~. Favorable macroeconomic developments, greater financial market depth and integration, and greater flexibility in the baht have supported market activity. Other factors that may have increased foreign exchange activity are investors' increased appetite for exposure to Thailand and the region and growing global search for yield.¹⁶

32. **Cross-country comparisons also suggest that the foreign exchange market is relatively well developed.** Market turnover, for the level of gross trade in goods and services and capital flows, is above average.¹⁷ Bid-ask spreads are tighter for the Thai baht compared to some regional currencies (Korean won, Indonesia rupee, Philippine peso, and Malaysian ringgit), although wider than some other, more liquid, emerging markets (e.g., Israel, Mexico, and Turkey) or financial centers (Singapore and Hong Kong).¹⁸ Average ticket size (US\$5 million) appears to be in line with most other countries.

33. **Among the key characteristics of the Thai foreign exchange market are:**

- **The market is relatively well developed, in particular at the short end.** The range of products includes spot, forwards, and certain derivatives (options, swaps, and interest rate swaps). Contracts for three months or less constitute the bulk of the market. Market survey data point to adequate liquidity in the spot, swap and forward market in tenors up to one year. There are no Thai baht future contracts traded, but the use of cross-currency swaps and options is growing.

¹⁶ Ho and others (2005) and Gelati and Melvin (2004).

¹⁷ Average daily market turnover data for April 2007 were annualized. For THA, the average daily for April approximated the actual daily average market turnover for 2007. Turnover data include the spot, forward, and swap market. Turnover can be used as indicator for assessing market liquidity, as well as bid-ask spreads and/or the average transaction size.

¹⁸ Deutsche Bank, Emerging Markets Currency Handbook , 2008.

- **The U.S. dollar still accounts for the bulk of currency trade, similar to other regional foreign exchange markets.** The dominance of the U.S. dollar in cross-currency transactions reflects its role as the vehicle currency in the region, and is still considered the cheapest way of settling currencies in the region as market liquidity tends to be concentrated in the local currency/U.S. dollar transactions.
- **Trading among banks accounts for the bulk of trade.** Survey data suggest that interbank trading accounted for 47 percent of foreign exchange turnover, bank-customer transactions for 29 percent, respectively, with nonresidents accounting for the remainder. Most interbank dealings are transacted on an electronic trading platform (Reuters dealing system) and over the counter. The trading, clearing and settlement system executes trades and orders on a timely and efficient basis. Banks, in particular foreign branches, actively use the foreign currency market for managing their local funding operations.
- **Swap operations are the preferred funding vehicle for banks.** Adequate liquidity in the swap market allows foreign banks, in particular, to run their baht funding and cash management operations through the swap market. The implied interest rates out of forward market (THB FIX) are used for pricing domestic interest rate swaps.¹⁹

34. **Some recent market trends are noteworthy.** Swap transactions dominated recent market turnover, while activity in the spot and forward markets declined. Swaps accounted for about two-thirds of market turnover, compared to 46 percent in 2004. While the use of forwards has increased since 1998, its demand has fallen more recently. This may reflect, among others, forward market restrictions on nonresidents since October 2003. Also, the role of nonresidents in market activity has declined over the past decade. Nonresidents' share fell from roughly 40 percent in 1998 to under 25 percent in 2007.²⁰ The reduced presence of nonresidents may, among others factors, reflect the impact of the capital controls introduced by the BOT.²¹

¹⁹ The money market cash curve is viewed as less reliable for pricing money market instruments and longer dated tradable fixed income instruments. The absence of a liquid money market cash curve does not pose a problem in itself, as baht funding operations can be carried out through foreign exchange swaps.

²⁰ Bank for International Settlements (BIS) 2007 survey data shows that cross-border trades accounted for over 60 percent of all turnover.

²¹ In September/October 2003, the BOT restricted nonresidents' access to baht funding. A credit ceiling was set at B 50 million for lending unrelated to a verifiable business transaction. The ceiling applies to direct lending, forwards and swaps. Residents also cannot borrow more than B 50 million from nonresidents.

D. Market Development: Issues and Policy Directions

35. **There is room to further enhance the efficiency of the Thai foreign exchange market.** Studies show that in well-functioning foreign exchange markets, exchange rates respond more effectively to market forces with durations of excess liquidity and deviations from price equilibrium less persistent.²² These markets tend to be characterized by relatively tight bid-ask spreads, lowering transaction costs; high turnover in volume and abundance in orders, minimizing price impact of individual trades; efficient trading, clearing, and settlement systems, facilitating efficient and timely execution of orders; and wide and diverse range of active market participants, ensuring that new orders flow quickly to correct order imbalances and misalignments. That is, imbalances quickly correct themselves and foreign exchange volatility reverts more quickly to levels witnessed before the shock. Reforms could further enhance the efficiency of the foreign exchange market:

- **Further easing of regulatory restrictions on nonresident activity in the onshore market and on resident activity abroad.** The BOT has relaxed surrender requirements, raised overall limits on outflows recently and in early 2008 removed the unremunerated reserve requirement. Nevertheless, the overall restrictiveness of the regime remains high and complex. Relaxing restrictions on inflows and outflows would enhance cross-border transactions and market turnover, lower transaction costs, expand the diversity of market participants, while allowing for more investment depth and some speculative trading, which are necessary for two-way trades and greater market liquidity.
- **As Thailand moves toward the implementation of risk-based banking regulatory framework, the BOT may want to consider relaxing net open position limits (NOPs) and liquid asset ratios (LARs) for banks.**²³ ~~Currently, the NOP limits are not binding and thus are not a hindrance to foreign exchange market development in Thailand. But~~ Similar initiatives have been undertaken elsewhere as a means to enhance the flexibility of liquidity management on the part of banks but also with an eye towards market development. ~~–Korea, for instance, –increased limits on NOPs to 50 percent of capital while Malaysia and Singapore completely abolished NOP limits and LARs. Under this approach, banks use instead their internal models to manage liquidity and market risk (including foreign exchange), providing them with greater flexibility in managing various risk exposures while at the same time encouraging market development. Similarly, restrictions governing derivatives transactions could also be eased under a risk-based supervision model. Risk management products such as options and –futures –and forward contracts~~ play an important role in attracting trading activities and promoting foreign

²² See Sarr and Lybek (2002) and Duttagupta and others (2004).

²³ The aggregate limit on NOP is set at 20 percent of capital while that on LAR is set at 6 percent. Compliance with NOP is verified on a daily basis. Banks will be moving toward Basel II at end-2008.

exchange market liquidity by permitting the pooling and trading of market and credit risks.²⁴ ~~As of now, most derivatives remain subject to case-by-case approval requirements by regulators.~~ Of course, supervisors would have to ensure that financial institutions have adequate internal capacity and controls to manage these risks.

- **Further developing deeper domestic money and bond markets.** Well-functioning foreign exchange markets typically co-exist with liquid domestic money and bond markets as these domestic markets can be used to establish pricing relationships between domestic and foreign currencies at different tenors and are important for managing risk exposures. Going forward, consideration could be given to developing a market for interest rate futures and addressing the fragmentation in the government securities market and some of the shortcomings in the issuance strategy. Recent measures to promote the repo market should also help to improve conditions in the money market, as well as for bond financing and short selling.
- **Streamlining documentation and reporting requirements, and moving toward a more market-friendly communication and monitoring framework.** Extensive documentation and reporting requirements for foreign exchange transactions entail significant transaction and compliance costs and can be a deterrent to market entry and activity. These problems can be reduced by moving toward risk-based supervision, greater use of surveys to gather data, as well as by the BOT enhancing its market liaison as a means to gather financial market intelligence.
- **Improving further the transparency of the foreign exchange market.** Thailand maintains a foreign exchange transaction reporting system, according to which banks must put all cross-border transactions above a certain limit in a central computerized system that includes the data of the participants in the transaction. While this information is useful for internal analysis and understanding source of foreign exchange market pressures through transactions volume, the BOT may want to consider publishing on a regular basis aggregate foreign currency market turnover data. Greater amount of publicly available information on foreign exchange transaction would help enhance price discovery and over time be beneficial to reducing volatility.
- **Enhancing the leadership role of private market organizations in market development and establishing standards.** The Association Cambiste Internationale and Thailand Bond Market Association currently lack the mandate and authority to push for international standards in market practices in the local foreign exchange, money and bond markets. There is also no real market forum to discuss comprehensive market

²⁴ BIS reports a negative relationship between market sophistication and regulatory restrictions (Hohensee and Lee, 2006).

development issues. Such market forums have proven effective in other countries and central banks typically participate as observers.